DRAFT -- To be published in DMT'10 Proceedings
(see http://ngmdb.usgs.gov/Info/dmt/)

Introduction

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The Digital Mapping Techniques '10 (DMT'10) workshop was attended by 110 technical experts from 40 agencies, universities, and private companies, including representatives from 19 State geological surveys (see Appendix A). This workshop, hosted by the California Geological Survey, May 16-19, 2010, in Sacramento, California, was similar in nature to the previous 13 meetings (see Appendix B). The meeting was coordinated by the National Geologic Map Database project. As in the previous meetings, the objective was to foster informal discussion and exchange of technical information. It is with great pleasure that I note that the objective was again successfully met, as attendees continued to share and exchange knowledge and information, and renew friendships and collegial work begun at past DMT workshops.

At this meeting, oral and poster presentations and special discussion sessions emphasized (1) methods for creating and publishing map products (here, "publishing" includes Web-based release); (2) field data capture software and techniques, including the use of LiDAR; (3) digital cartographic techniques; (4) migration of digital maps into ArcGIS Geodatabase format; (5) analytical GIS techniques; and (6) continued development of the National Geologic Map Database.

ACKNOWLEDGMENTS

My sincere appreciation is offered to the California Geological Survey (CGS), and especially to George Saucedo, who was the principal CGS organizer for this meeting. George was assisted by Margaret Hyland, Milind Patel, Chris Wills, and Karen Saucedo; together they provided the meeting attendees with a most enjoyable venue for learning and exchanging technical information. I also thank the California Geological Survey (CGS) and the Director and State Geologist, John Parrish, for hosting this meeting, and for encouraging his staff to participate; in the first seven papers of these Proceedings the mapping science and digital techniques of the CGS are highlighted. Last, but not least, I thank all attendees for their participation; their enthusiasm and expertise were the primary reasons for the meeting's success.

PRESENTATIONS AND POSTERS

The workshop included 21 oral presentations, 3 discussion sessions, and 24 posters. Many are supported by a paper contained in these Proceedings. The papers describe technical and procedural approaches that currently meet some or all needs for digital mapping at the respective agency. There is not, of course, a single "solution" or approach to digital mapping that will work for each agency or for each program or group within an agency; personnel and funding levels, and the schedule, data format, and manner in which we must deliver our information to the public require that each agency design its own approach. However, the value of this workshop and other forums like it is through their roles in helping to design or refine these agency-specific approaches to digital mapping and to find applicable approaches used by other agencies. In other words, communication helps us to avoid having to "reinvent the wheel."

During the course of the 14 annual DMT meetings, it has been my pleasure to meet, and work with, the many talented people who have authored papers in these Proceedings. As the subjects addressed by the DMT meetings have become even more essential to the Nation's geological surveys, the demands placed on them have risen to the point where many authors scarcely have time to address their work fully. Predictably, less time is then available to compose written summaries of their work; I'm sure the readers (or at least other editors) can sympathize with this predicament. Therefore, I include with this Introduction a list of all presentations and posters (Appendix C). If the reader finds an interesting title that isn't recorded in these Proceedings, I encourage the reader to contact the authors directly. Further, some presentations and related information are available for download at http://ngmdb.usgs.gov/Info/dmt/DMT10presentations.html.

THE NEXT DMT WORKSHOP

The 15th annual DMT meeting will be held in the spring of 2011 in Williamsburg, Virginia. Please consult the Web site (http://ngmdb.usgs.gov/Info/dmt/) for additional information about this and other DMT meetings.

Appendix A. List of Workshop Attendees
[Grouped by affiliation]

Alaska Division of Geological and Geophysical Surveys
Jennifer Athey

American Institute of Professional Geologists
William Siok

Arizona Geological Survey
Ryan Clark

Arkansas Geological Survey
William Hanson

British Geological Survey
Jeremy Giles

California Department of Toxic Substances Control
Richard Fears
John Karachewski

California Department of Water Resources
Jonathan Mulder

California Geological Survey
John Clinkenbeard
Milton Fonseca
Carlos Gutierrez
Chris Higgins
Terilee Mc Guire
Timothy McCrink
Robert Moskovitz
John Parrish
Milind Patel
Ante Perez
Charles Real
Pete Roffers
Anne Rosinski
George Saucedo
William Short
James Thompson
Barbara Wanish
Chris Wills

Colorado State University - NPS Cooperator
James Chappell
Heather Stanton
Stephanie O'Meara

Engineering/Remediation Resources Group, Inc.
Mark Rogers

ESRI
Larry Batten
Peter Becker
Janel Day
Charles Frye
Willy Lynch

Geological Survey of Finland
Hannu Idman

Idaho Geological Survey
Jane Freed
Collette Gantenbein
Loudon Stanford

Kentucky Geological Survey
Matthew Crawford

Maine Geological Survey
Robert Marvinney

Minnesota Geological Survey
Harvey Thorleifson

Montana Bureau of Mines and Geology
Paul Thale

National Park Service
Bruce Heise
Georgia Hybels

Natural Resources Canada-Geological Survey of Canada
Christine Deblonde
Vic Dohar
David Everett
Andrew Moore

Nevada Bureau of Mines and Geology
Heather Armeno
Heather Green
Jordan Hastings
P. Kyle House
Gary Johnson
Jennifer Mauldin
Matthew Richardson

New Mexico Bureau of Geology and Mineral Resources
Adam Read
Peter Scholle
Shannon Williams

Nova Scotia Dept. of Natural Resources
Brian Fisher

Ohio Geological Survey
James McDonald

Oregon Department of Geology and Mineral Industries
Rachel Lyles
Jed Roberts

South Carolina Geological Survey
Erin Koch

U.S. Department of Energy
Susan Gregersen

U.S. EPA
Randall Ross

U.S. Forest Service
James Cloyd
Andrew Rorick

U.S. Geological Survey
Stafford Binder
Sky Bristol
Stephanie Brown
Ernest Crider
Tamara Dickinson
Jennifer Dieck
Mary DiGiacomo-Cohen
Carolyn Donlin
Christopher Garrity
Linda Gundersen
Ralph Haugerud
Theresa Iki
Linda Jacobsen
Donna Knifong
Richard Koch
Taryn Lindquist
Peter Lyttle
Jeremy McHugh
Kathryn Nimz
Randall Orndorff
Carol Ostergren
Lydia Quintana
Mark Reidy
Larry Robinson
Lisa Rukstales
Darlene Ryan
David Soller
Nancy Stamm
Frederic Wilson
Jan Zigler

University of Alabama
Douglas Behm

University of Tennessee
Andrew Wunderlich

University of the Pacific
Kurtis Burmeister
Luke Crawford
Shoko Yamamoto

Utah Geological Survey
Kent Brown

Washington State Department of Natural Resources
Robert Berwick

West Virginia Geological and Economic Survey
Keri Wilson

Western Washington University
Elizabeth Schermer

Wisconsin Geological Survey
Peter Schoephoester

Wyoming State Geological Survey
Allory Deiss
David Lucke
Phyllis Ranz

Appendix B. Previous Digital Mapping Techniques workshops

1997:
Hosted by the Kansas Geological Survey, Lawrence, Kansas, June 2-5. 73 technical experts attended, from 30 State geological surveys, the USGS, and the Geological Survey of Canada.
Soller, D.R., ed., 1997, Proceedings of a workshop on digital mapping techniques: Methods for geologic map data capture, management, and publication: U.S. Geological Survey Open-File Report 97-269, 120 p., http://pubs.usgs.gov/of/of97-269/.

1998:
Hosted by the Illinois State Geological Survey in Champaign, Illinois, May 27-30. More than 80 technical experts attended, mostly from the State geological surveys and the USGS.
Soller, D.R., ed., 1998, Digital Mapping Techniques '98—Workshop Proceedings: U.S. Geological Survey Open-File Report 98-487, 134 p., http://pubs.usgs.gov/of/of98-487/.

1999:
Hosted by the Wisconsin Geological and Natural History Survey in Madison, Wisconsin, May 19-22. 91 selected technical experts from 42 agencies, universities, and private companies attended, including representatives from 30 State geological surveys.
Soller, D.R., ed., 1999, Digital Mapping Techniques '99—Workshop Proceedings: U.S. Geological Survey Open-File Report 99-386, 216 p., http://pubs.usgs.gov/of/of99-386/front.html.

2000:
Hosted by the Kentucky Geological Survey in Lexington, Kentucky, May 17-20. 99 technical experts from 42 agencies, universities, and private companies attended, including representatives from 28 State geological surveys.
Soller, D.R., ed., 2000, Digital Mapping Techniques '00—Workshop Proceedings: U.S. Geological Survey Open-File Report 00-325, 209 p., http://pubs.usgs.gov/of/of00-325/.

2001:
Hosted by the Geological Survey of Alabama, in Tuscaloosa, Alabama, May 20-23. 108 technical experts from 48 agencies, universities, and private companies attended, including representatives from 31 State geological surveys.
Soller, D.R., ed., 2001, Digital Mapping Techniques '01—Workshop Proceedings: U.S. Geological Survey Open-File Report 01-223, 248 p., http://pubs.usgs.gov/of/2001/of01-223/.

2002:
Hosted by the Utah Geological Survey, in Salt Lake City, Utah, May 19-22. More than 100 technical experts from 40 agencies, universities, and private companies attended, including representatives from 30 State geological surveys.
Soller, D.R., ed., 2002, Digital Mapping Techniques '02—Workshop Proceedings: U.S. Geological Survey Open-File Report 02-370, 214 p., http://pubs.usgs.gov/of/2002/of02-370/.

2003:
Hosted by the Pennsylvania Geological Survey, in Millersville, Pennsylvania, June 1-4. Nearly 90 technical experts from 36 agencies, universities, and private companies attended, including representatives from 22 State geological surveys.
Soller, D.R., ed., 2003, Digital Mapping Techniques '03—Workshop Proceedings: U.S. Geological Survey Open-File Report 03-471, 262 p., http://pubs.usgs.gov/of/2003/of03-471/.

2004:

Hosted by the Oregon Department of Geology and Mineral Industries, in Portland, Oregon, May 16-19. Nearly 100 technical experts from 40 agencies, universities, and private companies attended, including representatives from 22 State geological surveys.
Soller, D.R., ed., 2004, Digital Mapping Techniques '04—Workshop Proceedings: U.S. Geological Survey Open-File Report 2004-1451, 220 p., http://pubs.usgs.gov/of/2004/1451/.

2005:
Hosted by the Louisiana Geological Survey, in Baton Rouge, Louisiana, April 24-27. More than 100 technical experts from 47 agencies, universities, and private companies attended, including representatives from 25 State geological surveys.
Soller, D.R., ed., 2005, Digital Mapping Techniques '05—Workshop Proceedings: U.S. Geological Survey Open-File Report 2005-1428, 268 p., http://pubs.usgs.gov/of/2005/1428/.

2006:
Hosted by the Ohio Geological Survey, in Columbus, Ohio, June 11-14. More than 115 technical experts from 51 agencies, universities, and private companies attended, including representatives from 27 State geological surveys.
Soller, D.R., ed., 2007, Digital Mapping Techniques '06—Workshop Proceedings: U.S. Geological Survey Open-File Report 2007-1285, 217 p., http://pubs.usgs.gov/of/2007/1285/.

2007:
Hosted by the South Carolina Geological Survey, in Columbia, South Carolina, May 20-23. More than 85 technical experts from 49 agencies, universities, and private companies attended, including representatives from 27 State geological surveys.
Soller, D.R., ed., 2008, Digital Mapping Techniques '07—Workshop Proceedings: U.S. Geological Survey Open-File Report 2008-1385, 140 p., http://pubs.usgs.gov/of/2008/1385/.

2008:
Hosted by the Idaho Geological Survey, in Moscow, Idaho, May 18-21, 2008. More than 100 technical experts from 39 agencies, universities, and private companies attended, including representatives from 19 State geological surveys.
Soller, D.R., ed., 2009, Digital Mapping Techniques '08—Workshop Proceedings: U.S. Geological Survey Open-File Report 2009–1298, 217 p., http://pubs.usgs.gov/of/2009/1298/.

2009:
Hosted by the West Virginia Geological Survey, in Morgantown, West Virginia, May 10-13, 2009. Almost 90 technical experts from 42 agencies, universities, and private companies attended, including representatives from 24 State geological surveys.
Soller, D.R., ed., 2011, Digital Mapping Techniques '09—Workshop Proceedings: U.S. Geological Survey Open-File Report 2010–1335, 260 p., http://pubs.usgs.gov/of/2010/1335/.

Appendix C. List of oral and poster presentations, and discussion sessions

Oral Presentations (listed in order of presentation)

Building a National Archive - Standards development and the National Geologic Map Database
By David R. Soller and Nancy R. Stamm (U.S. Geological Survey)

I came, I digitized, I posted: An existential look back over twenty years of digital mapping in Idaho
By Loudon R. Stanford (Idaho Geological Survey)

Opengeoscience: meeting the UK's geospatial data requirements in geoscience
By P. Bell, R. Hughes, K. Westhead, and J. Giles (British Geological Survey)

From data collection to publishing maps on the Web: the Nova Scotia experience
By Brian E. Fisher, Jeff C. Poole, Jeff S. McKinnon, and Angie L. Ehler (Nova Scotia Department of Natural Resources, Mineral Resource Branch)

Geological Map Flow - How the Geological Survey of Canada is streamlining map compilation and delivery
By Andrew Moore (Geological Survey of Canada)

Automation in ArcGIS 10: Understanding the changes taking place and options for migration of legacy code
By Andrew L. Wunderlich (University of Tennessee - Knoxville)

Update on ESRI Cartographic Representations for the FGDC Digital Cartographic Standard for Geologic Map Symbolization
By Charlie Frye and Janel Day (ESRI)

A plan and plea for increasing communication about digital geologic mapping
By Jennifer E. Athey (Alaska Division of Geological & Geophysical Surveys)

The Nevada Digital Dirt Mapping Project: An experiment in supervised crowd-sourcing for rapid geologic map development with ArcSDE
By P. Kyle House and Heather Green (Nevada Bureau of Mines and Geology), and Abbey Grimmer (Department of Geography, University of Nevada)

Derivative maps from geologic maps: Mitigating hazards and planning for resources
By Chris Wills (California Geological Survey)

Discussion Session -- "Recommended citations for unpublished GIS files"
Moderated by Dave Soller (U.S. Geological Survey).
Increasingly, unpublished GIS files and related information are being derived from pre-existing publications. Soon thereafter, or perhaps many years in the future, these files are used in new publications. How can we try to ensure that not only the unpublished GIS file, but also its source(s) of information, are informatively cited in new publications? It's critical to our science that years from now, the original and authoritative source of all cited information can be found. This brief session introduced the challenge and offered some suggestions.

Discussion Session -- "Acquiring high-quality digital base maps"
Moderated by Randy Orndorff, Allen Crider, and Dave Soller (USGS).
Geologic mapping projects depend on high quality digital base maps. With the move away from paper topographic maps and mylar hard copies, significantly more effort is now needed to acquire a usable base map. There are many sources for digital base maps, many methods of creating them, and uneven quality. Easy access to standardized, high-quality digital base map layers (perhaps including, but not limited to, LIDAR) is a critical requirement of geologic mapping projects. This session addressed required elements and technical requirements of products to be developed by The National Map and other sources, and attempted to formalize guidance to management.

We have a Dream
By Holger Kessler, Andy Hughes, Jeremy Giles, and Denis Peach (British Geological Survey)

Building a surficial geology data model for mapping projects
By Christine Deblonde (Geological Survey of Canada)

The NPS GRI: Data model concepts and implementation, and a programmatic approach to digital map production
By Stephanie O'Meara, James Chappell, Heather Stanton, and Ron Karpilo (Colorado State University and the National Park Service)

NCGMP09 - Draft standard format for digital publication of geologic maps
By National Geologic Map Database Project and Pacific Northwest Geologic Mapping Project (U.S. Geological Survey)

What's coming in ESRI ArcGIS 10 for better, faster, more efficient geologic maps, map production, and map serving
By Willy Lynch (ESRI)

Mapping regulatory floodplains with Lidar and USGS StreamStats
By Jed Roberts and John English (Oregon Department of Geology and Mineral Industries)

Digital mapping of potential mineral hazards in California: Naturally occurring asbestos, radon, and highway corridors
By John P. Clinkenbeard, Ronald K. Churchill, and Chris T. Higgins (California Geological Survey)

Image data management and use with ESRI ArcGIS
By Peter Becker (ESRI)

Application of geologic maps and resources to support regulatory review of environmental sites
By Rick Fears and John Karachewski (California Department of Toxic Substances Control)

Producing geologic maps and GIS products supporting the Geological Map Flow Project
By Vic Dohar (Natural Resources Canada)

A window to the National Geologic Map Database (NGMDB) Map Catalog via ArcGIS Image Server - Wyoming pilot project
By Chrisopher P. Garrity, David R. Soller, and Mark E. Reidy (U.S. Geological Survey)

Discussion Session - "Cartographic Design & Map Production"
An informal time to show maps and discuss map design and preparation techniques.

Poster Presentations (listed alphabetically, by author)

Seamless Bedrock Geology of Finland - A new Map Service at http://www.geo.fi/en/
By Niina Ahtonen, Hannu Idman, Jyrki Kokkonen, Jukka Kousa, Jouni Luukas, Mikko Nironen, and Jouni Vuollo (Geological Survey of Finland)

An Interactive session on the National Digital Catalog of Geologic and Geophysical Data: questions, answers, and feedback
By R. Sky Bristol and Richard E. Brown (U.S. Geological Survey)

Radon in California
By Ron Churchill (California Geological Survey)

The National Geothermal Datasystem: Geothermal data in the U.S. Geoscience Information Network
By Ryan Clark, Steve Richard, and Wolfgang Grunberg (Arizona Geological Survey)

Naturally occurring asbestos in California
By John Clinkenbeard (California Geological Survey)

Assessing early stages of landslide inventory
By Matthew M. Crawford and William M. Andrews (Kentucky Geological Survey)

Integrating Style files and Carto Representation into the Geological Map Flow process (the GSC's implementation of the FGDC geologic symbology)
By Dave Everett and Vic Dohar (Natural Resources Canada)

Map production: Software tools, tricks, and stratagems
By Jane Freed and Collette Gatenbein (Idaho Geological Survey)

Update on ESRI Cartographic Representations for the FGDC Digital Cartographic Standard for Geologic Map Symbolization
By Charlie Frye and Janel Day (ESRI)

Assessing Erosion Potential and Coccidioides immitis Probability Using Existing Geologic and Soils Data
By Will Harris and Peter Roffers (California Geological Survey)

Development of digital-map products of potential mineral and mining-chemical hazards along selected highway corridors in northern California
By Chris T. Higgins, Ronald K. Churchill, Cameron I. Downey, and Milton C. Fonseca (California Geological Survey)

Using surficial geologic maps to derive areas prone to alluvial fan flood hazards
By Jeremy T. Lancaster, Thomas E. Spittler, and William R. Short (California Geological Survey)

Coal basin, Pitkin County, Colorado - An example of NGMDB data capture, conversion, and 3D editing in ArcGIS10
By Willy Lynch (ESRI)

GIS-based digital photogrammetry for geologic and hazard mapping
By Timothy P. McCrink and Florante G. Perez (California Geological Survey)

Evaluating the validity of mine subsidence insurance claims using a GIS software application
By James McDonald (Ohio Division of Geological Survey)

Cenozoic geology of the Sacramento Valley
By Jonathan Mulder (California Department of Water Resources)

Building a National Archive - Standards development and the National Geologic Map Database
By The National Geologic Map Database Project

A window to the National Geologic Map Database (NGMDB) Map Catalog via ArcGIS Image Server - Wyoming pilot project
By Chrisopher P. Garrity, David R. Soller, and Mark E. Reidy (U.S. Geological Survey)

NCGMP09 - Draft standard format for digital publication of geologic maps
By National Geologic Map Database Project and Pacific Northwest Geologic Mapping Project (U.S. Geological Survey)

California Geological Survey zones of required investigation for earthquake-induced landslides - Livermore Valley, California
By Florante G. Perez, Wayne D. Haydon, and Mark O. Wiegers (California Geological Survey)

The New Mexico Bureau of Geology & Mineral Resources geologic data model, a comparison with other existing models
By Adam S. Read, Geoff Rawling, Daniel J. Koning, Sean D. Connell, J. Michael Timmons, David McCraw, Glen Jones, Mark Mansell, and Shannon Williams (New Mexico Bureau of Geology and Mineral Resources)

Digital mapping techniques used for preparation of State of California Seismic Hazards Zones Maps
By Anne Rosinski (California Geological Survey)

A draft structure for Minnesota Geological Survey information systems
By Harvey Thorleifson, Rich Lively, Bob Tipping, and Tim Wahl (Minnesota Geological Survey)

Utility of combined aerial photography and digital imagery for fault trace mapping
By Jerry A. Treiman, Florante G. Perez, and William A. Bryant (California Geological Survey)